REMARKS

A. Supplemental Information Disclosure Statement

Applicants are filing a Supplemental Information Disclosure Statement concurrently with the present Amendment. Applicants request that the Supplemental Information Disclosure Statement and the art cited therein be considered and made of record in the next Office Action.

B. 35 U.S.C. § 103

In the Office Action mailed on September 25, 2003, claims 1-12 and 18-20 were rejected under 35 U.S.C. §103 as being obvious in view of Ishizuka et al. Applicants traverse this rejection. A review of Ishizuka et al. reveals that Ishizuka et al. fails to disclose a number of elements recited in claim 1. For example, Ishizuka et al. fails to disclose or suggest using a transmission measuring graduation structure. As shown by the embodiments of FIGS. 1-9, the measuring graduation G2 is a reflection measuring graduation structure. The reason that Ishizuka et al. uses a reflection measuring graduation is that "a small and thin size of the overall apparatus" (see Abstract) is desired. Accordingly, Ishizuka et al. teaches away from using the larger apparatus that would entail if a transmission measuring graduation were employed.

Further evidence that there is no motivation to use a transmission measuring graduation in Ishizuka et al. is that Ishizuka et al. does not appreciate the disadvantages of using its reflection measuring graduation structure. The graduated disk with the measuring graduation is usually the part of the encoder which is rotated because of its coupling to the rotatable shaft. The rotation of the shaft and the graduated disk however is never a "perfect" rotation due to mechanical errors of the system. As consequence it might be that the graduated disk and the measuring graduation are tilted by small angles in the rotation plane and something like a

tumbling movement of the graduated disk occurs. Such an undesired tilting has significant consequences on the scanning beams which impinge on the measuring graduation and leave the measuring graduation in the direction of the downward-arranged next graduation in the scanning beam path. In the case of the reflection measuring graduation of Ishizuka, such disturbing effects are increased when compared with a transmission measuring graduation due to a certain leverage effect. This means that the reflected beams from the rotating reflection measuring graduation of Ishizuka do not leave the measuring graduation in the correct output direction but are somehow deflected from this direction if the graduated disk tumbles. Such a deflection has consequences in connection with the generated position-dependent output signals. This is because certain phase relationships between the interfering beam paths are required on the next graduation. These relationships cannot be guaranteed if the output direction of the reflected beams from the measuring graduation changes. Errors in the scanning signals are very likely.

In contrast herewith a rotating transmission measuring graduation as recited in claim 1 offers significant advantages. Such advantages result from the fact that a potential tilting or tumbling of the graduated disk in the course of its rotation does not result in a significant deflection of the transmitted beams (as compared with reflected beams in a reflection measuring graduation). Accordingly measuring errors due to the imperfect rotation of the graduated disk can be avoided by this measure.

In summary, there is no suggestion to alter Ishizuka et al.'s reflection graduation G2 to be a transmission measuring graduation structure and so the rejection is improper and should be withdrawn.

It should be noted that while claim 1 does recite a reflection scanning graduation structure, such structure is arranged directly on the housing opposite the scanning unit. Ishizuka et al. does not disclose or suggest arranging a reflection scanning graduation structure on a housing opposite a scanning unit. Further evidence that Ishizuka et al. does not suggest directly arranging a reflection scanning graduation on the recited housing is that Ishizuka et al. does not appreciate the advantage of such an arrangement that ensures that the reflection scanning graduation is very stably arranged and so provides improved characteristics for the output directions of the reflected beams should the reflection graduation be tilted.

The rejection of claim 1 is also improper because Ishizuka et al. fails to disclose or suggest using arranging a measuring graduation structure to be "located between the scanning unit and the scanning graduation structure." As shown in FIGS. 1-9 of Ishizuka et al., the measuring graduation G2 faces both grating G1 and grating G3 and is not located between the two. Since there is no suggestion for locating graduation G2 between gratings G1 and G3, the rejection is improper and should be withdrawn.

The rejection of claim 1 is improper for the additional reason that claim 1 recites that "the beams of light emitted by the light source first reach the measuring graduation structure," which is associated with a rotatable graduated disk. A review of the operation of the embodiment of FIG. 1 of Ishizuka et al., which is representative of the other embodiments described in Ishizuka et al., demonstrates that Ishizuka et al. does not disclose or suggest having the light first reach a measuring graduation structure. As shown in FIG. 1, a light beam R is generated by light source 1 and directed onto a diffraction grating G1. The light beam R is diffracted by the diffraction grating G1 causing 0^{th} order and $+1^{st}$ order beams R_0 and R_{+1} to be projected onto a rotary

diffraction grating G2 at points P2b and P2a, respectively. As shown in FIG. 1, the two beams impinging on grating G2 are further diffracted as rays R_0^{+1} and R_{+1}^{-1} that impinge on a further grating G3 wherein diffracted light from G3 is sent to a detector. Thus, Ishizuka et al.'s beam first reaches graduation G1 before reaching the rotatable graduation G2.

The Office Action has argued that Ishizuka et al. does not specifically disclose that the reflection graduation structure G2 is stationary and the transmission graduation structure G3 is rotatable. The Office Action asserted that Ishizuka et al. merely disclosed that gratings G2 and G3 were displaceable relative to one another. Based on this argument, the Office Action asserted that it would have been obvious to have G2 be stationary and G3 rotate. This argument has no basis in fact. First, contrary to the assertions of the Office Action, Ishizuka et al. explicitly discloses that grating G2 rotates. In particular, Ishizuka et al. discloses that radial grating G2 is on disk 4 that is coupled to a rotary object which rotates about axis Da. (Col. 2, ll. 50-54).

Rotation of grating G3 would not lead to a workable/feasible system since it is a linear grating (Col. 2, ll. 56-57). In particular, should gratings G1 and G2 be stationary, rotation of linear grating G3 would not lead to usable data since there would be no assurance that the beams reflected from grating G2 are always recombined grating G3. In this example, only in certain angular relative positions of gratings G2 and G3 will the beams recombine. Even if gratings G1 and G3 are rotated together relative to grating G2, this would not lead to a practical system since it would be necessary to rotate light source 1 and detector 6 together with gratings G1 and G3. There is no motivation for such an alteration since it would lead to unacceptable mechanical strains on the various components when high rotational speeds are reached. In summary, the Office Action's simple reasoning of switching the rotation of gratings G2 and G3 belies the fact

that one of ordinary skill in the art would understand that the proposed alteration requires significant knowledge about potential error sources in a rotary interferential encoder. Since Ishizuka et al. does not understand the problems involved with such an alteration, there is would have been no motivation for one of ordinary skill to perform such an exchange. Since Ishizuka et al. does not disclose or suggest rearranging gratings G2 and G3 so that the light beam R reaches a rotating grating first, the rejection is improper and should be withdrawn.

A further sign that the rejection is improper is seen by a review of the rejections of the dependent claims 3-12 and 18-19. These claims recite various ways to fasten a scanning graduation to a housing (claims 3-5) or arranging the scanning graduation with a housing (claims 6-12 and 17-18). The Office Action has taken Official Notice that the motivations of maintaining alignment or simpler manufacturing for the fastening or arrangement of gratings. The rejection only states in general that it would have been obvious to fasten or arrange a grating. However, this analysis is improper. The claims recite particular, not general, modes of fastening or arranging. The Office Action has not addressed whether the specifically recited claimed features, such as the gluing of claim 5, are obvious. Furthermore, the Official Notice regards the motivation for the concepts of fastening or arranging and does not provide specific motivation for each specific claim. Thus, the rejection is improper and should be withdrawn. If this rejection is repeated, Applicants request that each claim be addressed and that a specific motivation be given that is applicable for that particular claim.

Claim 20 is patentable for the additional reason that Ishizuka et al. does not disclose or suggest a structure such that tilting or tumbling of the scanning graduation structure with respect

to the measuring graduation structure does not affect a position of position-dependent signals received by a detector element.

C. Claims 13-15 and 17

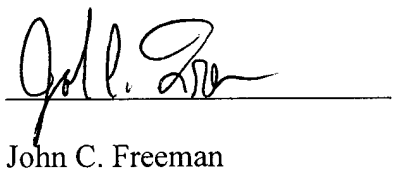
Applicants note that claims 13-15 and 17 have not been rejected. Applicants can only assume that the claims have been deemed to contain allowable subject matter. Since claims 13 and 17 have been amended to be in independent form, claims 13 and 17 and their dependent claims should be allowed.

As noted above, claims 13 and 17 have been amended to be in independent form. Since the amendments incorporate subject matter that was inherently present in claims 13 and 17 previously, the amendments are not being presented for reasons of patentability as defined in *Festo Corporation v. Shoketsu Kinzoku Kogyo Kabushiki Co., Ltd*, 234 F.3d 558, 56 USPQ2d 1865 (Fed. Cir. 2000) (*en banc*), *overruled in part*, 535 U.S. 722 (2002).

CONCLUSION

In view of the arguments above, Applicants respectfully submit that all of the pending claims 1-20 are in condition for allowance and seek an early allowance thereof. If for any reason, the Examiner is unable to allow the application in the next Office Action and believes that an interview would be helpful to resolve any remaining issues, he is respectfully requested to contact the undersigned attorneys at (312) 321-4200.

Respectfully submitted,



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